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INTRODUCTION.

This REVIEW is based on reports for January, 1890, from 1,934 regular and voluntary observers. These reports are classified as follows: 166 reports from Signal Service stations; 120 monthly reports from United States Army post surgeons; 1,270 monthly reports from state weather service and voluntary observers; 25 reports from Canadian stations; 353 marine reports through the co-operation of the Hydrographic Office, Navy Department; marine reports through the "New York Herald Weather Service;" monthly weather reports from the local weather services of Alabama, Arkansas, Colorado, Illinois, Indiana, the Iowa Weather Crop Bulletin Service, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Meteorological Report of the Missouri State Board of Agriculture, Nebraska, Nevada, New England, New Jersey, New York, North Carolina, North and South Dakota, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, and Texas, and international simultaneous observations. Trustworthy newspaper extracts and special reports have also been used. Snow blockades or floods prevented the forwarding of reports of the Central Pacific Railway Company, and the rainfall observations of the United States Geological Survey in the southern plateau region, in time to be used in this issue of the REVIEW.

CHARACTERISTICS OF THE WEATHER FOR JANUARY, 1890.

The most disastrous storms of the month occurred from the middle Mississippi valley to the Great Lakes and thence eastward to New England during the 12th and 13th, within the area of a low pressure storm which first appeared as a feeble disturbance in the middle Rio Grande valley the night of the 11th, and thence moved northeastward with greatly increased energy, passing over the middle Mississippi valley to Lake Michigan during the 12th, over Michigan and Lake Huron during the night of the 12–13th, and east-northeast over Canada during the 13th. Destructive local storms occurred at distances varying from one hundred and fifty to three hundred miles to the southward of the centre of the main cyclone on the afternoon of the 12th. At Saint Louis, Mo., and Clinton, Ky., lives were lost, many persons were injured, and much property was destroyed by tornadoes. Great destruction was also caused at other places in western Kentucky, notably at Wickliffe and Moscow, and at other points in the Ohio and middle Mississippi valleys. On the 12th heavy snow storms, with high wind and falling temperature, occurred in Minnesota, the Dakotas, Kansas, Nebraska, and Iowa. In Minnesota, the Dakotas, Nebraska, and Kansas the snow drifted heavily and caused a general blockade to railroads. On the 12th and 13th the storm along the lower lakes and in parts of New York and New England was one of the severest experienced in many years, and was attended by fatalities and great destruction of property. In January, 1889, a severe storm, which followed a similar track to that pursued by the storm above referred to, advanced from southern Texas northeastward over the middle Mississippi valley, lower Lake Michigan, Michigan, and Lake Huron, and thence eastward north of the Saint Lawrence River from the 7th to 10th. This storm was attended by numerous local storms of unusual violence from the middle Mississippi valley eastward, and very destructive gales in the Ohio Valley, the Lake region, the middle Atlantic states, and New England. Over the north Atlantic ocean the storms of January, 1890, were exceptionally severe, more especially over mid-ocean, where heavy gales prevailed throughout the month.

The highest temperature reported for the month was 97°, at Fort Ringgold, Tex., and the lowest temperature noted was —42°, at Martindale, Mont. The month was warmer than the average January east of the Rocky Mountains, except in Minnesota and the upper Missouri valley, and was colder than usual on the Pacific coast, over the middle and northern plateau regions, and near the Gulf of Saint Lawrence. The greatest departures above the average temperature occurred in the middle Atlantic states south of New York, at Lake Erie stations, and in the Ohio and lower Mississippi valleys, where they exceeded 10°; the highest mean temperature ever reported for January was noted along the Atlantic and east Gulf coasts, and in the southern plateau region; and at a number of the older established Signal Service stations in New England, the middle and south Atlantic states, the Florida Peninsula, the Gulf States, the Ohio Valley and Tennessee, the Lake region, the upper Mississippi and lower Missouri valleys, and the southern plateau region, the absolute maximum temperature was the highest ever reported for January. The greatest departures below the average temperature were noted in northern Montana and the British Possessions to the northward, where they were more than 10°, and at stations in northern Montana, northern Nevada, and California it was the coldest January on record. Unusually heavy frost was reported at Keeler, Cal., on the 6th, and frost injured vegetation in southern Louisiana on the 16th and 17th.

The heaviest precipitation reported was 33.40 at Upper Mattole, Humboldt Co., Cal., and the precipitation amounted to 20.00, or more, in eastern California between the thirty-eighth and fortieth parallels, and in a small area on the west-central coast of California. In southwestern Washington, western Oregon, northwestern California, east-central Arkansas, south-central Indiana, south-central Illinois, southeastern Missouri, and east-central Texas the precipitation exceeded ten inches. In areas in southwestern Arizona, south-central Colorado, north-central New Mexico, northeastern South Dakota, and near the south coast of Great Salt Lake, Utah, no precipitation was reported. The precipitation was below the average for the month in the Atlantic coast and

east Gulf states, from the upper Lake region westward to eastern Oregon and Washington, and from the upper Missouri valley southward to eastern Colorado and central New Mexico; elsewhere the precipitation was in excess of the January average. The greatest deficiencies occurred on the North Carolina coast, where they exceeded five inches, and on the middle coast of the Gulf of Mexico, where they exceeded four inches. The greatest excesses were noted in the middle Mississippi and lower Ohio valleys, where they exceeded five inches, and where in central Indiana they were more than seven inches; and on the Pacific coast, south of the Columbia River, where they exceeded four inches, and where, at Los Angelos, Cal., they amounted to more than five inches. At stations in New York, Arkansas, Tennessee, Indiana, Ohio, Michigan, Minnesota, Illinois, Missouri, Indian Territory, Colorado, Utah, Washington, and southern California, the precipitation was the greatest, while at stations in Pennsylvania, Virginia, North Carolina, Georgia, Florida, Alabama, Louisiana, and North Dakota, it was the least ever reported for January. The greatest depth of snowfall reported for the month was two hundred and twenty-nine inches at Cisco, Cal.; one hundred and ninety-four inches were reported at Towle's, Cal., and one hundred and sixty-nine inches at Emigrant Gap, Cal. During the latter half of the month about one hundred and twenty miles of the Central Pacific Railroad crossing the summit of the Sierra Nevada range of mountains was blockaded by snow. This was the heaviest snow blockade ever known on the Central Pacific Railroad. In the northern counties of Nevada the excessive snowfall entailed great loss to the cattlemen, and it is estimated that fully fifty per cent. of the live stock was lost on account of starvation and exposure.

Destructive floods occurred in the early part of the month in southern Missouri, eastern Arkansas, and northern and eastern Texas, destroying property to the value of millions of dollars, and streams in south-central and western Illinois and southern Indiana overflowed their banks, causing much damage to property and loss of live stock. About the middle of the month the smaller streams in western Pennsylvania and West Virginia overflowed their banks, doing much damage. During the latter part of the month warm rains melted a large amount of snow in the Sierra Nevada and Siskiyou mountains in northern California, causing streams to overflow, washing away railroad bridges and levees, filling cuts, flooding towns, and causing land-slides, and in the San Joaquin Valley and southern California heavy rains caused streams and canals to overflow, causing washouts, and flooding large tracks of country. Navigation was not entirely suspended on Lakes Michigan and Ontario, where the trips made by vessels were the latest on record, and the Straits of Macinac were still open to navigation on the 31st.

A remarkable feature of the month was the enormous quantity of Arctic ice encountered near Newfoundland and the Grand Banks. Ice records for the last eight years show that but small quantities of Arctic ice have been reported for January in the region referred to during that period, and that during the present winter there has been practically no interruption of the southward flow of icebergs and field ice from the region north of Newfoundland.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for January, 1890, as determined from observations taken daily at 8 a. m. and 8. p. m. (75th meridian time), is shown on chart ii by isobars. The difference between the mean pressure for January, 1890, obtained from observations taken twice daily at the hours named and that determined from hourly observations, varied at the stations named below, as follows: At Boston, Mass., New York City, Washington City, Savannah, Ga., Buffalo, N. Y., Cincinnati, Ohio, Saint Louis, Mo., New Orleans, La., and Galveston, Tex., the mean of 8 a. m. and 8 p. m. observations was higher by .009, .010, .010, .007, .002, .005, .001, .001 and .003, respectively, and at Saint Paul, Minn., Dodge City, Kans., Denver, Colo., Santa Fé, N. Mex., Salt Lake City, Utah, and San Francisco, Cal., the mean of the observations taken at these hours was lower by .001, .006, .006, .012, .002, and .013, respectively, than the true mean pressure. At Chicago, Ill., and Memphis, Tenn., the mean pressure obtained from the 8 a. m. and 8 p. m. observations corresponded with that determined from hourly observations.

For January, 1890, the mean pressure was highest from the Atlantic coast between the twenty-eighth and thirty-fifth parallels northwestward to eastern Tennessee, where it rose above 30.30, the highest mean reading, 30.34, being noted at Augusta, Ga. From this region there was a decrease in mean pressure northeastward to eastern Nova Scotia, where it fell below 30.05, and northward to the northern part of the upper Lake region, where the mean values were below 30.10. An area of relatively high mean pressure occupied the middle Missouri valley, with included readings above 30.25, whence there was a gradual decrease in mean pressure westward to the area of lowest mean pressure for the month, which occupied the north Pacific coast, where, from the mouth of the Columbia River northward, the mean values fell below 29.85.

A comparison of the pressure chart for January, 1890, with that of the preceding month shows that there has been an increase in pressure over the entire country, save along the immediate west Gulf coast where the means for the current month corresponded with, or were slightly lower than, those for December, 1889. The most marked increase in pressure occurred in the middle and upper Missouri and Saskatchewan valleys, where it amounted to more than .20 of an inch. In the current, as in the preceding month, the mean pressure was highest over the south Atlantic and the more eastern of the eastern Gulf states, and the increase in mean pressure in that region was about .05 of an inch. The lowest mean pressure, for each of the months referred to, was noted on the north Pacific coast, where the changes were slight. A notable feature in connection with the pressure changes was the appearance, for the current month, of an area of high pressure over the middle Missouri valley, with values above 30.25, where, for December, 1889, the mean readings averaged about .20 of an inch lower.

The mean pressure was generally above the normal east of the Rocky Mountains, except in the lower Rio Grande valley; it was also above the normal on the south Pacific coast and over the southern plateau region. The mean pressure was below the normal along the middle and north Pacific coasts, over the middle and northern plateau regions, and over northwestern Montana and the British Possessions to the northward. The greatest departures above the normal pressure were noted in North Carolina and Georgia, where they amounted to .16 and .15 at Charlotte and Augusta, respectively, and the most marked departures below the normal pressure occurred on the north Pacific coast, where they equalled or exceeded .15 near the mouth of the Columbia River.

BAROMETRIC RANGES.

The monthly barometric ranges at the several Signal Service stations are shown in the table of miscellaneous meteorological data. The general rule, to which the monthly barometric ranges over the United States are found to conform, is that they increase with the latitude and decrease slightly, though somewhat irregularly, with increasing longitude. In January, 1890, the monthly ranges were greatest over the northeastern part of lower Michigan and in eastern New England, where they exceeded 1.50, whence they decreased southward to less than .20 over southern Florida, to less than .30 along the east Gulf coast, and to less than .70 on the west Gulf coast, and